Measuring hotel employee perceived job risk: Dimensions and scale development

Abstract

Purpose – The main purpose of this study was to identify the dimensions of hotel employees' job risk perceptions and develop a measurement scale for this construct.

Design/methodology/approach – Four studies using a mixed-method design were conducted to develop and validate the scale of hotel employees' perceived job risk (HEPJR). Study 1 identified the dimensions and initial items of HEPJR through a literature review and in-depth interviews. In Study 2, an explanatory factor analysis was perform to refine the preliminary items. Study 3 further refined the HEPJR scale through a confirmatory factor analysis. Study 4 confirmed that HEPJR is a 19-item scale through a cross-validation analysis.

Findings – A reliable and valid scale was developed to measure the following five dimensions of HEPJR: perceived human, equipment, internal and external environmental, and management risks. HEPJR and its dimensions significantly predict negative safety consequences and negative job satisfaction.

Research limitations/implications – Employees in medium- and high-star-rated hotels in China were surveyed. Future research should test the HEPJR scale in other types of lodging formats (e.g., budget hotels, homestays, or cruise ships) and different countries or regions.

Practical implications – Given the increasingly serious job risks faced by hotel employees, the HEPJR scale can become a benchmark for job risk identification, accident prevention, and safety management.

Originality/value – This scale provides a clear conceptualization and an appropriate measurement tool of HEPJR from a risk-source perspective.

Keywords – Perceived job risk; Accident causation theory; Hotel employees; Scale development

Article Type – Research paper

1. Introduction

Hospitality is an employee-dependent business, and employee safety at work is vital for the provision of high-quality services to guests and, consequently, the sustainable development of the industry (Zopiatis *et al*., 2014). Unfortunately, due to the high level of employees' perceived risks at work, many hotels experience high turnover rates, poor employee job satisfaction, and low productivity (Chen *et al*., 2018; Krause *et al*., 2005). Moreover, the high level of perceived job risk is associated with negative social images, which further influence new employee recruitment. These challenges represent an obstacle to the sustainable development of the hospitality industry. Therefore, hotel employees' perception of job risks must be systematically examined.

Job risks refer to the dangers that workers face when performing their duties, and employees' evaluation of risks constitutes the perceived job risk (Basha and Maiti, 2013). Hotel employees are exposed to various potential risks at work. The risks may arise from the improper behaviour of customers or colleagues (Harris and Reynolds, 2004; Gill *et al*., 2002) or result from equipment hazards (Krause *et al*., 2005; Sierra *et al*., 2012). Risk factors may also originate from the external environment, such as natural disasters and refugee crises (Henderson, 2005; Ivanov and Stavrinoudis, 2018). All these factors affect employees' assessment of their risks at work. However, adequate knowledge and effective management practices to address employees' perceived job risks in the hospitality industry remain lacking.

Most studies have focused on the characteristics of job risks, while an in-depth exploration

of a measurement scale of hotel employee perceived job risk (HEPJR) remains a gap in the literature. Previous studies have predominantly investigated HEPJR in relation to specific groups (Sönmez *et al*., 2018), positions (Krause *et al*., 2005), and risk issues (Bach and Pizam, 1996) and explored occupational injury disparities across genders, races, and injury types (Buchanan *et al*., 2010). Several researchers have analysed the diversity, universality, and complexity of job risks and insecurity to explain employee job risk (e.g., Tian *et al*., 2014). However, job insecurity and job risk are two different constructs. Job security attaches great importance to job stability, while job risk includes potential risks that arise from various sources ranging from human, equipment and management to the environment (Leveson, 2004) and endanger personal, property, and psychological safety (Basha and Maiti, 2013).

This research fills the above-mentioned literature gap by developing a reliable and valid scale of HEPJR based on accident causation theory, which helps define the construct and identifies the sources of risks. The development of this scale provides a new avenue for hospitality research. Hotel managers could be equipped with a novel tool to measure employees' perceived risk at work. This study provides several important implications for hotel managers to reduce accidents and promote sustainable hotel development. This article is organized as follows. First, based on accident causation theory, a clear conceptualization of HEPJR is provided from the risk-source perspective. Second, a reliable and valid tool measuring HEPJR is proposed through a mixed-method research design. Finally, the implications for both theory and practice are discussed.

2. Literature review

2.1. Accident causation theory

Accident causation theory suggests that the laws and common patterns of accidents can be identified and that prevention measures can be taken to minimize similar accidents in the future (Grant *et al*., 2018; Li *et al*., 2017). The occurrence of accidents often has common patterns and triggers, and risk is any factor that increases the possibility of an accident's occurrence (Elvik, 2016). Risk is the potential state and preparatory process of accident occurrence. Leveson (2004) suggested that accidents involve an interaction among the following four major elements: man, machines, media, and management (the 4Ms). Deviation from any system element can render employees exposed to risk (Lower *et al*., 2018). The 4M-risk-induced framework of accident causation theory has been widely adopted by studies in several areas, such as coal mining (Song and Xie, 2014), marine transportation (Chen, 2014), and engineering management (Mao and Xu, 2011). However, the 4M-risk-induced framework has not received much attention in hospitality.

Extant hospitality research is limited to specific categories of risks, such as occupational injuries, public safety, and natural disasters (Buchanan *et al*., 2010; Henderson, 2005; Hua and Yang, 2017), which has led to the lack of a systematic understanding of the concept of HEPJR. The 4M-risk-induced framework provides such a systemic approach to understanding the risk factors that employees encounter from varying sources (Lower *et al*., 2018). This research applies the 4M-risk-induced framework to the conceptualization and operationalization of the HEPJR construct.

2.2. Job risk

The goal of job risk research is to improve employee occupational health and corporate safety performance. Table 1 presents the various definitions of job risk and related concepts. Job risk is commonly considered a negative working condition (Karatepe and Sokmen, 2006). Perceived job risk refers to employees' evaluations of the risks to which they are exposed at work (Basha and Maiti, 2013).

[Insert Table 1 about here]

2.3. HEPJR

Hotel employee job risks are risk factors that cause staff to suffer unfortunate events, such as threats, danger, injuries, and losses during or related to their work. HEPJR represents the overall judgements of employees of risk factors and the risk status of a hotel. The concept of employee perceived job risk has been proposed in prior studies, and this research extended the concept to hospitality and developed a scale of HEPJR.

Following the 4M-risk-induced framework, this research conceptualizes HEPJR as a construct consisting of the following five dimensions: human, equipment, environment (internal and external), and management. Table 2 summarizes previous studies relevant to HEPJR based on these risk source dimensions.

[Insert Table 2 about here]

2.3.1. Perceived human risk

The human factor refers to an individual's behaviour in a work setting (Leveson, 2004, 2011). In the context of hotel services, this factor is reflected in the behaviours of customers, colleagues, and employees. Misconducts, such as negligence, inappropriate interactions, and emotional responses, may cause behavioural conflicts among employees and customers, leading to negative circumstances on both sides (Harris and Reynolds, 2004). Differences in religion, gender, race, age, and educational background among employees in various hotel departments may generate conflicts at work (Krause *et al*., 2005). The lack of employee safety awareness, attitudes, and skills represent significant causes of injuries and accidents (Baser *et al*., 2016; Buchanan *et al*., 2010). Additionally, excessive workloads and long working hours are common sources of HEPJR (Krause *et al*., 2005).

2.3.2. Perceived equipment risk

Equipment risk refers to the possibility of threats, injuries, and other adverse consequences that hotel employees suffer due to the lack of equipment, poor equipment performance, equipment failure, or mismatches between people and machines. The lack of adequate safety equipment can be an important injury factor in workplaces. Moreover, equipment that has design defects or is difficult to operate may cause employee injuries (Baser *et al*., 2016; Krause *et al*., 2005). Equipment in hotels must be regularly tested, repaired, and updated to avoid unsafe conditions and reduce equipment malfunction (Jones, 2001; Lai and Yik, 2012).

2.3.3. Perceived environmental risk

Environmental risk refers to the possibility of threats, injuries, and other adverse situations that hotel staff may experience due to environmental factors. The hotel environment comprises the following two sub-environments: the controllable internal environment and the uncontrollable external environment.

The external environment is the natural environment (physical environment) and social environment (physicochemical environment) surrounding a hotel. The specific risk factors are more diverse. For example, hotel employees in areas prone to natural disasters are often exposed to more risk than other employees (Méheux and Parker, 2006). Employees may also be at risk of disease and infection if there is a lack of hygiene or an epidemic near the hotel (Chien and Law, 2003). In the case of a social or refugee crisis in the region where a hotel is located (Ivanov and Stavrinoudis, 2018; Pappas, 2018; Šegota and Mihalič, 2018), the employees may suffer from income reduction, unemployment, and other specific job risks. Additionally, hotel employees may be at risk of specific organized criminal activities in the local area, such as terrorist attacks, theft, and fraud (Enz and Taylor, 2002; Hua and Yang, 2017; Gill *et al*., 2002).

The internal environment refers to hotel employees' working environments, which include the physical environment, such as air quality and workplace conditions, and the physicochemical environment, such as the organizational climate and teamwork environment. The internal environment is an important production space for customer service, information sharing, teamwork, and career development. A negative working environment may result in role ambiguity, performance pressure, team conflicts, and other adverse behavioural consequences

(Karatepe and Sokmen, 2006). Since the external and internal environments of hotels have different risk sources and consequences, it is appropriate to measure these environments separately.

2.3.4. Perceived management risk

Management risk refers to the possibility of threats, injuries, and other negative impacts that hotel staff encounter as a result of the negligence or lack of professional risk systems at the organizational or managerial levels. Hotel management risk includes institutional factors, such as the lack of a security risk management department, loss of job security functions, lack of contingency plans, and inadequate emergency response capabilities (Enz and Taylor, 2002; Gill *et al*., 2002), and managerial factors, such as the lack of warnings, neglect of safety, insufficient safety training, poor daily management, and inadequate accident management (Chen et al., 2012; Baser *et al*., 2016). Management risk factors do not include routine management behaviour in non-secure situations and equipment malfunctions (Leveson, 2004).

3. Methodology and scale development

This research employed a mixed-method approach following Churchill's (1979) guidance. Four studies were conducted (Figure 1). Study 1 generated the dimensions and initial items through a literature review, semi-structured qualitative interviews with hotel employees, an expert panel and a pilot test survey; Study 2 collected data using a survey of hotel employees for scale refinement; Study 3 further refined the scale through another survey involving a different sample of hotel employees; and Study 4 validated the scale based on a nationwide online survey of hotel employees.

[Insert Figure 1 about here]

3.1. Study 1: Dimensions and measurement of HEPJR

Since neither an adequate conceptual model nor a measurement scale of HEPJR exists, a literature review and semi-structured interviews with a panel of experts were used to identify the dimensions and generate the initial items of HEPJR.

3.1.1. Item generation

Five senior managers (four directors and one general manager) and eight frontline employees (housekeeping, front office, concierge, etc.) aged 23-45 years were interviewed. The total length of the interviews was more than 200 minutes, and the average length of each interview was 15 minutes. After the semi-structured interview with the 13th respondent, no new insights were obtained over the previous 12 interviews, indicating that saturation was reached

based on the information provided by these 13 respondents.

The interview outline consisted of five dimensions and 27 themes summarized from the literature (Table 2). During the interviews, each respondent was asked questions to elicit their thoughts and experiences regarding each dimension and describe the risk situations to which they were exposed at work. The respondents were asked to describe the risk factors causing potential adverse consequences in the (1) hotel workplace; (2) hotel external environment; (3) hotel internal environment; (4) hotel facilities and equipment; (5) interactions among employees, customers, and colleagues; and (6) hotel management. The respondents were also asked to share their ideas and experiences concerning HEPJR, particularly information not included in the six dimensions.

A content analysis was performed to organize and classify the responses. Three researchers coded the transcripts into 107 statements and generated 29 items after reading, classifying, and combining the respondents' expressions. It was found that HEPJRs were not the same as the 27 themes derived from the literature. Four new themes were added, five themes were not mentioned, and three themes were expanded. In total, 29 initial items were finally generated. In each dimension, the number of coded statements varied from 17 to 28. The research team assessed the content accuracy of the 29 items with the assistance of five Ph.D. students and two professors. Two items that did not belong to HEPJR were eliminated (IER-02 and IER-03); eight items that had the same connotation but different expressions were combined (HR-03, HR-04, EER-01, EER-04, MR-03, and MR-05); three items with inappropriate expressions were

modified (EER-02, HR-01, and IER-01), and two new items were added. Twenty-six items were identified and retained for further analysis.

3.1.2. Content validity

An expert review panel assessed the content validity of the HEPJR scale. The panel consisted of two professors, four associate professors and four doctoral candidates who had experience with conducting academic research concerning hospitality management and tourism safety. A self-administered questionnaire was used in Round 1, and the items were rated (1=strongly disagree to 5=strongly agree) by identifying redundancy, content ambiguity, and absence of inter-correlation. In Round 2, items with mean values of two or lower were revised through an expert group discussion. As a result, seven items were revised, and two new items were added. The panel reached a consensus regarding the 28 items to accurately reflect the concept of HEPJR. These 28 items were categorized into five dimensions, including six items for perceived human risk, five items for perceived equipment risk, six items for perceived external environmental risk, five items for perceived internal environmental risk, and six items for perceived management risk.

3.1.3. Pilot test

A pilot test was conducted to reevaluate the effectiveness of the initial dimensions and items in three star-rated hotels in Xiamen and Quanzhou in Fujian Province. In total, 236 valid responses were obtained from employees, yielding a response rate of 78.7%. The subject to item

ratio exceeded 5:1, the threshold suggested by Gorsuch (1974).

The item-to-total correlations and an explanatory factor analysis (EFA) were conducted for 28 items. “Poor items” were revised according to the following criteria: a) the items were poorly correlated ($r < 0.3$) with the total score (Bagozzi, 1981; Churchill, 1979); b) the community of items was below 0.5; and c) both the factor loading ($r < 0.5$) and cross-loading were examined. Consequently, three items were removed, and five items were revised, forming a 25-item scale.

3.2. Study 2: Refinement of the scale

Study 2 aimed to refine the items developed in Study 1. A sample of employees working in several five-star hotels in Quanzhou, Xiamen, and Shanghai was invited to participate in the study in December 2017. Undergraduate students on internships at the hotels were employed to deliver questionnaires after work through convenience sampling. The questionnaires were distributed and collected on-site. This procedure ensured the validity of the data by informing the respondents about the research purpose and ensuring anonymity. Each item was anchored on a 7-point Likert-scale (i.e., “strongly disagree” =1 to “strongly agree”=7). In total, 281 hotel employees were invited to complete the questionnaires, and 226 valid responses were received, resulting in an 80.4% response rate.

3.3. Study 3: Further scale refinement

The purpose of Study 3 was to further refine the factor structure and items produced in Study 2 and confirm the convergent and discriminant validity of HEPJR through a confirmatory

factor analysis (CFA). Study 3 employed undergraduate students, who were interns at the hotels, to deliver questionnaires starting from March 2018 for a period of three months. The east and southeast areas of China have developed economies and vibrant hospitality markets. The data were collected from 19 star-rated hotels in the following five cities: Hong Kong (two hotels), Macau (one hotel), Quanzhou (three hotels), Xiamen (12 hotels), and Shanghai (one hotel). The data were collected from medium- and high-star-rated hotels, including thirteen 5-star, four 4-star, and two 3-star hotels. Nine participating hotels were international chain brands (e.g., Hilton, Hyatt, and Sheraton), and 10 hotels were local hotel brands (e.g., Yeohwa and Fliport). Hilton, Hyatt, and Sheraton are among the most recognized hotel chains worldwide, and Yeohwa and Fliport are local hotel brands with distinctive features in southeast China. In total, 496 questionnaires were distributed, and 407 valid responses were received, yielding an 82.1% response rate.

3.4. Study 4: Scale validation

The results of Study 3 confirmed the convergent and discriminant validity of the HEPJR scale. However, the correlation between perceived equipment and human risk was concerning, and the correlations among perceived external environment risk, perceived human risk, and perceived equipment risk were lower than expected. Therefore, another expert review was conducted to reconsider these items. It was found that some human risk items were worded in a manner that may have led the respondents to think more about equipment or environmental factors (PHR-01 and PHR-02). Moreover, some equipment items were worded in a manner that

might have led the respondents to think that they were the result of improper staff behaviour (e.g., PER-01, PER-02, PER-03, PER-04, and PER-05). The wording of these items was adjusted without significantly modifying the meanings.

Study 4 re-examined the factor structure produced in Study 3 and confirmed the cross-validity and criterion validity of the HEPJR scale. Study 4 began with the launching of a fourth round of surveys in May 2019. Medium- and high-star-rated hotels in northeast (Jilin), east (Fujian), north (Beijing and Shanxi), south (Guangdong), southwest (Guizhou), and northwest China (Ningxia) were selected. The data were collected in 14 cities from 28 star-rated hotels, including ten 5-star, sixteen 4-star, and two 3-star hotels. This survey was conducted online through a leading market research website (www.wjx.cn). Hyperlinks to the questionnaire were posted on the WeChat groups of the employees of the hotels surveyed with the assistance of each hotel's human resources department. The survey lasted for seven days, and 1,015 responses were received; of these responses, 711 were considered valid, yielding a response rate of 70.1%.

Results

3.5. Results of Study 2

The sample consisted of 60.6% female and 39.4% male respondents. The largest age group was 20-29 years (70.8%), and the most frequently chosen range of monthly income was $372-743. Seventy-three percent had graduated from a junior college or higher. Some 81.0% were from frontline departments (front office, food and beverage, and housekeeping) and junior staff (43.4%) constituted the largest position group.

The internal consistency of the scale was examined, and the measurements were as follows: 1) Cronbach's alpha of each construct ranged from 0.789 to 0.953, indicating a good level of reliability; and 2) the item-to-total correlations were computed to determine the reliability of each item, which should exceed 0.30 (Bagozzi, 1981; Churchill, 1979); the results showed that the item-to-total correlation coefficients of each item were greater than this suggested level.

An EFA was conducted with a principal component analysis (PCA) and varimax rotation. The results showed that five factors had eigenvalues larger than one and that the cumulative contribution of variance was 72.1%. The Kaiser-Meyer-Olkin index was 0.907 (> 0.7), and the Bartlett spherical test was significant at the level of 0.001, justifying the use of an EFA. Both factor loadings ($r > 0.5$) and the community ($r > 0.5$) of each item were examined to eliminate "poor items." Two items were excluded, and the EFA was re-run with PCA and varimax rotation. As a result, five factors were extracted from the remaining 23 items, accounting for 75.1% of the

total variance (Table 3).

[Insert Table 3 about here]

3.6. Results of Study 3

The respondents were 56.5% female and 43.5% male. The proportion of the 20-29 age group was the highest (74.0%), and 81.3% had less than three years of work experience in hospitality. Most respondents had a monthly income of $372-743, and 72.5% had graduated from junior college or higher. Some 79.5% were from frontline departments and junior staff (47.1%) constituted the largest position group.

3.6.1. Common method variance (CMV)

To avoid CMV, the order of the questionnaire items was randomized, the answers to some items were arranged in opposite directions, and the participants were informed that their answers would be anonymous. Harman's single-factor test was conducted by entering all items for the PCA without rotation (Podsakoff *et al*., 2003). The results showed that the KMO index was 0.914, five factors with eigenvalues greater than one were extracted, and the largest variance was 40.6%. The potential error variable was controlled to avoid negative effects on the results. The common method factor was included in the structural model, which consisted of the original five factors. The results indicated that the Chi-square value had significantly changed ($\Delta\chi^2 = 121.598$, $\Delta df=19$, $p<0.05$), while the values of GFI, IFI, CFI, TLI, RMSEA, and RMR slightly changed. Thus, CMV was not a concern in this research.

3.6.2. Reliability and validity assessment

A CFA was conducted using AMOS 22.0, and a maximum-likelihood analysis was performed. The Cronbach alphas of each dimension ranged from 0.819 to 0.945, indicating the reliability of the HEPJR scale. The construct, convergent, discriminant, and nomological validities were considered. The convergent validity determines whether each factor is a single-dimensional construct. In accordance with Bagozzi (1981) and Hair *et al*. (2010), items that met the following criteria were eliminated: 1) the standardized factor loading was below the recommended 0.5 threshold, 2) the composite reliability (CR) was lower than 0.70, and 3) the average variance extracted (AVE) was below the cut-off value of 0.50. As a result, combined with the model modification indices, four items (FR_01, FR_02, PR_01, and IER_05) were deleted to obtain better model-fit indices (χ^2=322.457, *df*=139, p=0.000, χ^2/df=2.230, GFI=0.927, RMR=0.081, RMSEA=0.057, NFI=0.945, CFI=0.968, and AGFI=0.900).

The criteria for establishing discriminant validity are that the inter-construct correlations are lower than 0.85 and the square root of each construct's AVE (Bagozzi, 1987). The results showed that each construct satisfied this requirement, indicating good discriminant validity. To assess the nomological validity, the correlations between each construct were examined (Hair *et al*., 2010). As indicated by the correlation matrix, the five constructs of HEPJR were all correlated at the significance level of 0.001, demonstrating nomological validity.

3.7. Results of Study 4

The sample was composed of 63.6% females and 36.4% males. Some 32.6% were 20-29 years old and 32.3% were 30-39. Almost 40% had less than three years of work experience in hospitality. The most frequently chosen range of monthly income was $372-743, and high school (37.1%) constituted the largest education group. Some 68.8% were from frontline departments and junior staff (50.2%) constituted the largest position group.

3.7.1. Reliability and validity assessment

A meta-analytic approach was adopted to determine the external validity of HEPJR. Using the nonparametric Spearman's rank correlation test, the correlations between the ordinal global HEPJR item and other ordinal items were examined. By cross-checking with the extant literature, the research team developed a global item, i.e., "I feel that working at this hotel is very unsafe." After the item was designed, the experts were asked for their opinions regarding the item. All experts agreed that this item summarized HEPJR. The results showed that the correlations between the global item and other indicators were significant and positive, confirming the good external validity of HEPJR.

In each dimension, the Cronbach alphas ranged from 0.781 to 0.860, indicating the reliability of the HEPJR scale. The standard factor loadings ranged from 0.631 to 0.917; CR ranged from 0.783 to 0.870, and AVE ranged from 0.522 to 0.694, showing good convergent validity (Table 4 and Table 5). The correlation coefficients between the constructs were lower than 0.70 and the square root of each construct's AVE, thus discriminant validity was confirmed.

[Insert Table 4 and Table 5 about here]

3.7.2. Model comparison of HEPJR

Four competitive models were constructed to determine the optimal factor structure of HEPJR. Model 1 was a first-order factor model with 19 items (Figure 2-1); Model 2 consisted of five uncorrelated first-order factor models (Figure 2-2); Model 3 consisted of five correlated first-order factor models (Figure 2-3); and Model 4 was a second-order factor model with five first-order factors (Figure 2-4).

Models 1 and 2 had the same degrees of freedom, but Model 1 showed an inferior goodness of fit and a higher Chi-square value, implying that Model 2 was superior to Model 1. Additionally, Models 3 and 4 demonstrated better goodness of fit than Models 1 and 2, and in the CFA, the two models showed high fit indices. However, Model 3 had lower Chi-square and RMSEA values and a better goodness-of-fit index and adjusted goodness-of-fit index (χ^2=441.969, *df*=140, p=0.000, χ^2/df=3.157, GFI=0.939, SRMR=0.052, RMSEA=0.061, NFI=0.934, CFI=0.954, and AGFI=0.917). In Model 4, the loadings of the initial five factors (PHR, PER, PIER, PEER, and PMR) on the second-order HEPJR were 0.572, 0.569, 0.714, 0.863, and 0.739, all of which exceeded 0.5 and were statistically significant at the 0.001 level. This finding indicates that Model 3 was the best measurement structure of HEPJR (Figure 2-3) and that a second-order factor for the scale of HEPJR was appropriate (Figure 2-4).

[Insert Figure 2 about here]

3.7.3. Cross-validity

To assess the cross-validity of the HEPJR scale, an invariance test was performed. Two random sub-samples (50% vs. 50%) were created from the original sample. One sample was used as a calibration sample (n = 355), and the other sample was used as a validation sample (n = 356). The baseline model of the unconstrained model (χ^2=615.493, *df*=280; CFI=0.949; RMSEA=0.041; SRMR=0.059) and the factor loading constrained model (χ^2=635.866, *df*=294; CFI=0.948; RMSEA=0.040; SRMR=0.058) indicated a good model fit. A Chi-square difference test was performed between the calibration and validation samples, and the result was invariant ($\Delta\chi^2$ (Δdf =14)=20.373; *p*=0.119). The above results indicate that the HEPJR scale was invariant in different groups and showed the cross-validity of the five-dimensional structure of HEPJR.

3.7.4. Criterion-related validity

In previous works, job risk was identified as an important antecedent of safety consequences and job satisfaction (Basha and Maiti, 2013). It was hypothesized that the higher the job risk employees perceived, the lower their job satisfaction, and the more serious the negative safety consequences. Three items measuring negative safety consequences were adapted from Huang et al. (2006), and three items measuring job satisfaction were adapted from Pugh *et al*. (2011). The question items were anchored on a 7-point Likert-scale based on work experience in respective hotels. The relationships among HEPJR, job satisfaction, and safety consequences were examined to assess the criterion-related validity. The results indicated that HEPJR and its dimensions were significantly and positively correlated with negative safety consequences and

negatively correlated with job satisfaction. Therefore, the criterion-related validity of the scale was confirmed.

4. Discussion and conclusions

4.1. Conclusions

The primary purpose of this research was to provide a clear conceptualization and a reliable and valid measurement scale of HEPJR from the risk-source perspective. To achieve this goal, this research closely followed the scale development procedure proposed by Churchill (1979). Four studies were conducted, including the generation of dimensions and initial items (Study 1), scale refinement (Study 2), scale re-refinement (Study 3), and scale validation (Study 4). The results confirmed that the measurement model proposed for HEPJR was applicable to a first-order factor model with correlation and a second-order factor model. Additionally, the invariance test of cross-validity confirmed that the HEPJR scale is invariant in different samples, and the test of criterion-related validity confirmed that HEPJR and its dimensions significantly predict negative safety consequences and job satisfaction.

This study shows that there were dimensional differences in the perceived levels of job risk among hotel employees. According to the data (Study 4), perceived human (mean = 3.99) and equipment risks (mean = 4.15) were relatively high, and the levels of these two dimensions were significantly higher than those of external environmental (mean = 2.29), internal environmental (mean = 2.51), and management (mean = 2.15) risks, indicating category differences in HEPJR. These results were consistent with the findings from the interviews. The hotel employees were greatly concerned about human and equipment risks, while concerns about environmental and management risks were relatively weak.

4.2. Theoretical implications

The current research enriches the current knowledge of HEPJR by conceptualizing and verifying HEPJR as a multidimensional construct from a risk-source perspective based on the 4M-risk-induced framework of accident causation theory. Previous studies measured perceived workplace risk as a sub-dimension of the organizational safety climate (Zohar, 1980). According to Basha and Maiti (2013), the job risk perceived by employees can be measured at four levels, including deadly risk, general risk, health risk, and safety perceptions. The risk source (because of humans) differs from the risk consequence (employee injury). In contrast to previous studies (e.g., Zohar, 1980; Basha and Maiti, 2013), the risk-source perspective adopted in this study provides more clearly-structured and inclusive dimensions of the perceived job risk in the hotel industry.

The newly developed HEPJR scale covers hotel employees' specific work environments and behavioural settings while considering various types of risk information that may affect HEPJR assessment. Although some dimensions of job risk, such as risk at the staff level, including occupational disease, customer-employee conflict, and work-family conflict, have been discussed in previous studies (Harris and Reynolds, 2004; Karatepe and Sokmen, 2006; Buchanan *et al*., 2010), risk at the environmental level, such as social crises, public safety issues, and natural disasters (Henderson, 2005; Gill *et al*., 2002), has rarely been discussed in hospitality research. Thus, this study compensates for this gap in the existing literature.

Consistent with the previous literature, this research confirms that the information affecting

HEPJR is derived from multiple subjects (Harris and Reynolds, 2004; Gill *et al*., 2002) and various sources (Henderson, 2005; Ivanov and Stavrinoudis, 2018), including human, equipment, environmental, and management risks. This research further shows that the environmental risks perceived by hotel employees can be subdivided into internal and external environmental dimensions (Zohar, 1994; Chien and Law, 2003; Karatepe and Sokmen, 2006; Méheux and Parker, 2006), expanding the concept of environmental risk in the 4M-risk-induced framework.

The HEPJR scale advances contemporary hospitality research by providing a measurement tool for follow-up empirical studies. The emerging theoretical implications include that HEPJR is potentially an important predictor of job satisfaction and turnover intention and that health, safety and security management practices can help reduce HEPJR.

4.3. Practical implications

This research has several practical implications. First, hotel managers can use the scale for a better classification of job risks and, subsequently, develop tailored strategies for managing safety based on each dimension. Regarding human risk, hotels should incorporate the misconduct of customers, colleagues, and even employees into the scope of management. Regarding equipment risk, hotels should strengthen the management of facilities and equipment in terms of allocation, failure, aging, and use. Regarding environmental risk, hotels should divide such risk into two sub-components, namely, internal and external environmental risks, which should not only strengthen risk management in the workplace but also improve risk avoidance in the community. Regarding management risk, hotels should pay attention to the development of

professional safety work and strengthen the safety cultures and mechanisms at the organizational level.

Second, the scale can be used to assess the perceived risk levels of hotel employees and, thus, help hotel managers develop and improve risk management strategies. The scale can be used as a diagnostic tool to continuously monitor changes in employees' perceived job risk levels and provide decision support for optimizing hotel risk management practices. The finding that HEPJR is a significant predictor of negative safety consequences and job satisfaction suggests that effective risk or safety management strategies can help enhance employee job satisfaction and performance and improve job attractiveness at recruitment.

Third, the findings indicate that employees had higher levels of perceived human and equipment risk and were less concerned about environmental and management risk. Hotel managers should invest more in staff, equipment, and other resources to more effectively reduce these risk factors. Moreover, job stability and security are important factors affecting employee recruitment and occupational choices. Hotels with low perceived job risk could have a high level of employee satisfaction and retention. Additionally, there is a close relationship between job risk and negative occupational images. Therefore, hotels must strengthen HEPJR management to enhance the occupational safety images held by hotel employees, which could have a positive influence on the employment success rate in the hotel industry.

4.4. Limitations and future research

There are several limitations to this research. First, the present research identified the characteristics of HEPJR only in Chinese hotels. Previous hospitality studies have shown that HEPJR varies by region, race, gender, and position (Buchanan *et al*., 2010). Future research should expand the sample sizes and investigate HEPJR in contexts with different cultural backgrounds and risk orientations. Second, only employees in mid- and high-star-rated hotels were surveyed. Employees may perceive job risks differently depending on the star level, size, and type of hotel. Future studies could validate the HEPJR scale in other types of lodging formats (e.g., budget hotels, homestays, or cruise ships). Finally, future research could advance the field of study by exploring the antecedents (e.g., organizational culture, leadership, and safety programs) and consequences (e.g., employee loyalty, customer service quality, and hotel brand equity) of HEPJR.

References

Albattat, A.R. and Matsom, A.P. (2014), "Emergency planning and disaster recovery in the Malaysian hospitality industry", *Procedia - Social Behavioral Sciences*, Vol. 144, pp. 45-53.

Ale, B., Baksteen, H., Bellamy, L.J., Bloemhof, A., Goossens, L. and Hale, A. (2008), "Quantifying occupational risk: the development of an occupational risk model", *Safety Science*, Vol. 46 No. 2, pp. 176-185.

Aneziris, O.N., Topali, E. and Papazoglou, I.A. (2012), "Occupational risk of building construction", *Reliability Engineering & System Safety*, Vol. 105 No. 3, pp. 36-46.

Bach, S. and Pizam, A. (1996), "Crimes in hotels", *Journal of Hospitality and Tourism Research*, Vol. 20 No. 1, pp. 59-76.

Bagozzi, R. P. (1981), "Evaluating structural equation models with unobservable variables and measurement error: A comment", *Journal of Marketing Research*, Vol. 18 No. 3, pp. 375-381.

Baser, F., Ture, H., Abubakirova, A., Sanlier, N. and Cil, B. (2016), "Structural modeling of the relationship among food safety knowledge, attitude and behavior of hotel staff in Turkey", *Food Control*, Vol. 73, pp. 438-444.

Basha, S.A. and Maiti, J. (2013), "Relationships of demographic factors, job risk perception and work injury in a steel plant in India", *Safety Science*, Vol. 51 No. 1, pp. 374-381.

Buchanan, S., Vossenas, P., Krause, N., Moriarty, J., Frumin, A., Shimek, J A.M., Mirer, F., Orris, P. and Punnett, L. (2010), "Occupational injury disparities in the US hotel industry", *American Journal of Industrial Medicine*, Vol. 53 No. 2, pp. 116-125.

Chen, K.Y., Chang, C.W. and Wang, C.H. (2018), "Frontline employees' passion and emotional exhaustion: the mediating role of emotional labor strategies", *International Journal of Hospitality Management*, Vol. 76, pp. 163-172.

Chen, W. (2014), "A quantitative fuzzy causal model for hazard analysis of man-machine-environment system", *Safety Science*, Vol. 62 No. 2, pp. 475-482.

Chen, Y.Y., Chuang, Y.J., Huang, C. H., Lin, C. Y. and Chien, S. W. (2012), "The adoption of fire safety management for upgrading the fire safety level of existing hotel buildings", *Building Environment*, Vol. 51, pp. 311-319.

Chien, G.C.L. and Law, R. (2003), "The impact of the Severe Acute Respiratory Syndrome on hotels: a case study of Hong Kong", *International Journal of Hospitality Management*, Vol. 22 No. 3, pp. 327-332.

Churchill, G.A. (1979), "A paradigm for developing better measures of marketing constructs", *Journal of Marketing Research*, Vol. 16 No. 1, pp. 64-73.

Corchado, E., Han, Y. and Fyfe, C. (2010), "Way finding during fire evacuation; an analysis of unannounced fire drills", *Building Environment*, Vol. 45 No. 3, pp. 537-548.

Deery, M.A. and Shaw, R.N. (2016), "An investigation of the relationship between employee turnover and organizational culture", *Journal of Hospitality Tourism Research*, Vol. 23 No. 4, pp. 387-400.

Elvik, R. (2016), "Does the influence of risk factors on accident occurrence change over time?", *Accident Analysis & Prevention*, Vol. 91, pp. 91-102.

Enz, C.A. and Taylor, M.S. (2002), "The safety and security of U.S. hotels A post-September-11 report", *Cornell Hotel Restaurant Administration Quarterly*, Vol. 43 No. 5, pp. 119-136.

Gill, M., Moon, C., Seaman, P. and Turbin, V. (2002), "Security management and crime in hotels", *International Journal of Contemporary Hospitality Management*, Vol. 14 No. 2, pp. 58-64.

Gorsuch, R.L. (1974), *Factor Analysis*, Philadelphia, WB Saunders.

Graham, T.L. and Roberts, D.J. (2000), "Qualitative overview of some important factors affecting the egress of people in hotel fires", *International Journal of Hospitality Management*, Vol. 19 No. 1, pp. 79-87.

Grant, E., Salmon, P.M., Stevens, N.J., Goode, N. and Read, G.J. (2018), "Back to the future: What do accident causation models tell us about accident prediction?", *Safety Science*, Vol. 104 No. 4, pp. 99-109.

Greenhalgh, L. and Rosenblatt, Z. (1984), "Job insecurity: toward conceptual clarity", *Academy of Management Review*, Vol. 9 No. 3, pp. 438-448.

Hair, J.F., Anderson, R.E., Tatham, R.L. and Black, W.C. (2010), *Multivariate Data Analysis: A Global Perspective 7 Pearson*, Upper Saddle River, New York, NJ.

Harris, L.C. and Reynolds, K.L. (2004), "Customer behavior: an exploration of types and motives in the hospitality industry", *Journal of Services Marketing*, Vol. 18 No. 5, pp. 339-357.

Harris, L.C. and Ogbonna, E. (2006), "Service sabotage: A study of antecedents and consequences", *Journal of the Academy of Marketing Science*, Vol. 34 No. 4, pp. 543-558.

Henderson, J.C. (2005), "Responding to natural disasters: managing a hotel in the aftermath of the Indian Ocean tsunami", *Tourism Hospitality Research*, Vol. 6 No. 1, pp. 89-96.

Hsieh, Y.C., Apostolopoulos, Y. and Sönmez, S. (2015), "Work conditions and health and well-being of Latina hotel housekeepers", *Journal of Immigrant Minority Health*, Vol. 18 No. 3, pp. 1-14.

Hua, N. and Yang, Y. (2017), "Systematic effects of crime on hotel operating performance",

Tourism Management, Vol. 60, pp. 257-269.

Huang, Y.H., Ho, M., Smith, G.S. and Chen, P.Y. (2006), "Safety climate and self-reported injury: assessing the mediating role of employee safety control", *Accident Analysis & Prevention*, Vol. 38 No. 3, pp. 425-433.

Ivanov, S. and Stavrinoudis, T.A. (2018), "Impacts of the refugee crisis on the hotel industry: Evidence from four Greek islands", *Tourism Management*, Vol. 67, pp. 214-223.

Jones, C. (2001), "Facilities management in medium-sized UK hotels", *International Journal of Contemporary Hospitality Management*, Vol. 14 No. 2, pp. 72-80.

Karatepe, O.M. and Sokmen, A. (2006), "The effects of work role and family role variables on psychological and behavioral outcomes of frontline employees", *Tourism Management*, Vol. 27 No. 2, pp. 255-268.

Karatepe, O.M. and Uludag, O. (2008), "Affectivity, conflicts in the work-family interface, and hotel employee outcomes", *International Journal of Hospitality Management*, Vol. 27 No. 1, pp. 30-41.

Kim, H.B., Lee, D.S. and Ham, S. (2013), "Impact of hotel information security on system reliability", *International Journal of Hospitality Management*, Vol. 35, pp. 369-379.

Krause, N., Scherzer, T. and Rugulies, R. (2005), "Physical workload, work intensification, and prevalence of pain in low wage workers: Results from a participatory research project with hotel room cleaners in Las Vegas", *American Journal of Industrial Medicine*, Vol. 48 No. 5, pp. 326-337.

Lai, J.H.K. and Yik, F.W.H. (2012), "Hotel engineering facilities: A case study of maintenance performance", *International Journal of Hospitality Management*, Vol. 31 No. 1, pp. 229-235.

Leveson, N. (2004), "A new accident model for engineering safer systems", *Safety Science*, Vol. 42 No. 4, pp. 237-270.

Leveson, N. (2011), *Engineering a safer world: Systems thinking applied to safety*, MIT Press.

Li, W., Zhang, L. and Liang, W. (2017), "An accident causation analysis and taxonomy (ACAT) model of complex industrial system from both system safety and control theory perspectives", *Safety Science*, Vol. 92, pp. 94-103.

Lower, M., Magott, J. and Skorupski, J. (2018), "A system-theoretic accident model and process with human factors analysis and classification system taxonomy", *Safety Science*, Vol. 110, pp. 1-33.

Mao, Y. and Xu, T. (2011), "Research of 4M1E's effect on engineering quality based on structural equation model", *Systems Engineering Procedia*, Vol. 1, pp. 213-220.

Méheux, K. and Parker, E. (2006), "Tourist sector perceptions of natural hazards in Vanuatu and the implications for a small island developing state", *Tourism Management*, Vol. 27 No. 2, pp. 69-85.

Pappas, N. (2018), "Hotel decision-making during multiple crises: A chaordic perspective", *Tourism Management*, Vol. 68, pp. 450-464.

Podsakoff, P.M., MacKenzie, S.M., Lee, J. and Podsakoff, N.P. (2003), "Common method variance in behavioral research: a critical review of the literature and recommended remedies", *Journal of Applied Psychology*, Vol. 88 No. 5, pp. 879-903.

Powell, P.H. and Watson, D. (2006), "Service unseen: The hotel room attendant at work", *International Journal of Hospitality Management*, Vol. 25 No. 2, pp. 297-312.

Pugh, S.D., Groth, M. and Hennig-Thurau, T. (2011), "Willing and able to fake emotions: a closer examination of the link between emotional dissonance and employee well-being", *The Journal of Applied Psychology*, Vol. 96 No. 2, pp. 377-390.

Ritchie, B.W., Dorrell, H., Miller, D. and Miller, G.A. (2004), "Crisis communication and recovery for the tourism industry: Lessons from the 2001 foot and mouth disease outbreak in the United Kingdom", *Journal of Travel & Tourism Marketing*, Vol. 15 N0. 2-3, pp. 199-216.

Rundmo, T. and Iversen, H. (2007), "Is job insecurity a risk factor in occupational health and safety?", *International Journal of Risk Assessment and Management*, Vol.7 No. 2, pp. 165-179.

Rundmo, T. and Sjöberg, L. (2010), "Risk perception by offshore oil personnel during bad weather conditions", *Risk Analysis*, Vol. 187 No. 1, pp. 111-118.

Seaman, P. and Eves, A. (2006), "The management of food safety—the role of food hygiene training in the UK service sector", *International Journal of Hospitality Management*, Vol.25 No.2, pp. 278-296.

Šegota, T. and Mihalič, T. (2018), "Elicitation of tourist accommodation demand for counter-seasonal responses: Evidence from the Slovenian Coast", *Journal of Destination Marketing & Management*, Vol.9, pp. 258-266.

Sierra, F.J.M., Rubio-Romero, J.C. and Ma, C.R.G. (2012), "Status of facilities for fire safety in hotels", *Safety Science*, Vol.50 No.7, pp. 1490-1494.

Skokic, V., Lynch, P. and Morrison, A. (2016), "Hotel entrepreneurship in a turbulent environment", *International Journal of Hospitality Management*, Vol.53, pp. 1-11.

Song, X. and Xie, Z. (2014), "Application of man-machine-environment system engineering in coal mines safety management", *Procedia Engineering*, Vol.84 No.2, pp. 87-92.

Sönmez, S., Apostolopoulos, Y., Lemke, M.K., Hsieh, Y. and Karwowski, W. (2018), "Complexity of occupational health in the hospitality industry: dynamic simulation modeling to advance immigrant worker health", *International Journal of Hospitality Management*, Vol.67, pp. 95-105.

Stansbury, D., Yeager, C., Chen, L., Mueller, C., Dunn, K.H., Almaguer, D. and Gong, F. (2009), "Respiratory and ocular symptoms among employees of a hotel indoor waterpark resort--Ohio, 2007", *Morbidity Mortality Weekly Report*, Vol. 58 No.4, pp. 81-85

Suleiman, A.M. and Svendsen, K.V.H. (2017), "Presentation of an approach for risk characterization of exposure to chemicals in cleaning work", *Safety Science*, Vol.91, pp. 148-153.

Tan, Z., Li, J. and Hu, G. (2014), "Risk assessment and countermeasures of gas accidents in the sensitive areas under control during the Olympic Games in Beijing", *Safety Science*, Vol.62 No.1, pp. 187-204.

Teeters, K., Jones, T. and Boatman, J.F. (1995), "Smoke gets in your eyes - examining air quality in casino-hotels", *Cornell Hotel Restaurant Administration Quarterly*, Vol.36 No.2, pp. 69-70.

Tian, Q., Zhang, L.C. and Zou, W.C. (2014), "Job insecurity and counterproductive behavior of casino dealers - the mediating role of affective commitment and moderating role of supervisor support", *International Journal of Hospitality Management*, Vol.40, pp. 29-36.

Zohar, D. (1994), "Analysis of job stress profile in the hotel industry", *International Journal of Hospitality Management*, Vol.13 No.3, pp. 219-231.

Zohar, D. (1980), "Safety climate in industrial organizations: theoretical and applied implications", *The Journal of Applied Psychology*, Vol.65 No.1, pp. 96-102.

Zopiatis, A., Constanti, P. and Theocharous, A.L. (2014), "Job involvement, commitment, satisfaction and turnover: evidence from hotel employees in Cyprus", *Tourism Management*, Vol.41 No.1, pp. 129-140.

Table 1. Definitions of job risk and relevant concepts

Concept	Target group	Definition	Dimension	Reference
Job risk	Industrial organization	The risk of a job is constructed from the risks associated with the hazards a worker faces when he or she performs the job	One-dimensional concept	Ale *et al*. (2008)
Job-risk perception	Steel plant	Job-risk perception refers to employees' perception of the amount of risk on the job	Four-dimensional concept	Basha and Maiti (2013)
Occupational risk	Building construction	The hazards that a worker is exposed to, the duration of the exposure and the integration of the risk to all hazards and workers		Aneziris *et al*. (2012)
Perceived risk level at the workplace	Production worker in industrial organization	Employees' negative perceptions of the workplace environment	One-dimensional concept	Zohar (1980)
Employee risk perception	Chemical company	Assessed the probability of accidents and injuries as well as worry and concern about potential hazards	One-dimensional concept	Rundmo and Iversen (2007)
Employee risk perception	Offshore oil personnel	Employee risk perception consists of a rational component, reflecting probability judgements, and an affective component, such as worry and concern.	Two-dimensional concept	Rundmo and Sjoberg (2010)
Job insecurity		Perceived powerlessness to maintain desired continuity in a threatened job	Multiple-dimensional	Greenhalgh and Rosenblatt

situation concept (1984)

Table 2. Themes of HEPJR

Dimensions	Themes	References
Perceived human risk (PHR)	Excessive workload	Krause *et al*. (2005)
	Occupational disease	Krause *et al*. (2005); Hsieh *et al*. (2015); Sönmez *et al*. (2018); Buchanan *et al*. (2010)
	Customers' improper behaviour	Harris and Reynolds (2004) ; Gill *et al*. (2002)
	Colleagues' improper behaviour	Gill *et al*. (2002); Harris and Ogbonna (2006)
	Work-family conflict	Karatepe and Sokmen (2006); Karatepe and Uludag (2008)
	Lack of safety skills	Corchado *et al*. (2010); Baser *et al*. (2016)
Perceived equipment risk (PER)	Difficult usage of hotel equipment	Krause *et al*. (2005); Sierra *et al*. (2012)
	Aged hotel facilities	Jones (2001); Lai and Yik (2012)
	Failure of hotel facilities	Stansbury *et al*. (2009)
	Lack of professional safety equipment	Enz and Taylor (2002); Sierra *et al*. (2012); Kim *et al*. (2013)
Perceived external	Industry competition	Šegota and Mihalič (2018); Skokic *et al*. (2016)
	Industry	Powell and Watson (2006)

environmental risk (PEER)	discrimination	
	Social crisis	Ivanov and Stavrinoudis (2018); Pappas (2018)
	Public safety	Enz and Taylor (2002); Hua and Yang (2017); Gill *et al*. (2002)
	Sanitation	Chien and Law (2003); Ritchie *et al*. (2004)
	Natural disasters	Méheux and Parker (2006); Henderson (2005)
Perceived internal environmental risk (PIER)	Air condition	Teeters *et al*. (1995)
	Working condition	Krause *et al*. (2005); Deery and Shaw (2016)
	Workplace risk	Hsieh *et al*. (2015); Baser *et al*. (2016)
	Working atmosphere	Karatepe and Sokmen (2006); Zohar (1994); Chen *et al*. (2018)
	Organization atmosphere	Deery and Shaw (2016)
Perceived management risk (PMR)	Lack of emergency plans	Enz and Taylor (2002); Chien and Law (2003); Albattat and Matsom (2014)
	Inadequate emergency response capabilities	Corchado *et al*. (2010); Graham and Roberts (2000); Tan *et al*. (2014)
	Lack of safety protection	Suleiman and Svendsen (2017)
	Lack of safety	Baser *et al*. (2016); Seaman and Eves (2006); Chen *et*

training	*al*. (2012)
Poor daily management	Chen *et al*. (2012); Gill *et al*. (2002)
Lack of warning	Sierra *et al*. (2012); Graham and Roberts (2000)

Table 3. Results of EFA

Dimension and item description	Study 2		
	Mean	Factor loading	Variance (%)
PHR (Cronbach'α=0.850)			
PHR_05. Customers' improper behaviour may hurt me.	4.68	0.731	14.393
PHR_01. Excessive workload may hurt my body.	4.40	0.725	
PHR_02. I will be accidentally injured if I disobey the rules.	4.65	0.719	
PHR_03. Long-term hotel work may cause severe back pain.	5.09	0.704	
PHR_04. My colleagues' improper behaviour may hurt me.	4.47	0.688	
PER (Cronbach'α=0.942)			
PER_03. Ageing hotel facilities may cause accidental injuries to me.	4.61	0.854	17.310
PER_04. Failure of hotel facilities may cause accidental injuries to me.	4.73	0.850	
PER_02. Difficult usage of hotel equipment may cause accidental injuries to me.	4.40	0.822	
PER_05. The lack of professional safety equipment may cause accidental injuries to me.	4.41	0.788	
PER_01. Bad hotel equipment may cause accidental injuries to me.	4.49	0.711	
PEER (Cronbach'α=0.800)			
PEER_02. Public safety around the hotel is not good.	2.62	0.89	10.148
PEER_01. The people around the hotel are not very friendly to me.	2.58	0.76	
PEER_03. The sanitation environment around the hotel is not clean.	2.86	0.743	
PIER (Cronbach'α=0.879)			
PIER_03. There are many hidden risks in the hotel.	3.28	0.832	14.028
PIER_04. The working atmosphere is very depressed in the hotel.	3.23	0.761	
PIER_02. The working conditions are not good in the hotel.	3.19	0.745	
PIER_01. The air quality is not good in the hotel.	3.18	0.669	

PIER_05. My supervisor and colleagues put me on the spot at work.	2.86	0.612	
PMR (Cronbach'α=0.953)			
PMR_03. The hotel rarely warns about job risks.	3.12	0.883	
PMR_02. The hotel lacks practical contingency plans.	2.98	0.870	
PMR_04. I am worried about the hotel's emergency response capabilities.	3.10	0.848	19.209
PMR_01. The hotel does not attach importance to emergency drills.	2.94	0.848	
PMR_05. I am worried about the hotel's ability to prevent work-related injuries.	3.18	0.847	

Table 4. Results of CFA

Dimension	Study 4				
	Mean	SD	Factor loadings	CR	AVE
PHR (Cronbach'α=0.808)					
PHR_02: Physical injury may occur if I disobey the rules.	4.11	2.28	0.681		
PHR_03: Long-term hotel work may cause severe back pain.	4.22	1.95	0.654		
PHR_04: My colleagues' improper behaviour may hurt me.	3.69	1.97	0.812	0.8129	0.5224
PHR_05: Customers' improper behaviour may hurt me.	3.93	1.89	0.734		
PER（Cronbach'α=0.860)					
PER_03: Ageing hotel facilities may cause accidental injuries.	4.35	1.99	0.883		
PER_04: Failure of hotel facilities may cause accidental injuries.	4.31	1.99	0.917	0.8702	0.6943
PER_05: The lack of professional safety equipment may cause accidental injuries.	3.79	2.14	0.680		
PEER (Cronbach'α=0.781)					
PEER_01: The people around the hotel are not very friendly to me.	2.31	1.57	0.667		
PEER_02: Public safety around the hotel is not good.	2.17	1.51	0.778	0.7830	0.5472
PEER_03: The sanitation environment around the hotel is not clean.	2.39	1.55	0.769		
PIER (Cronbach'α=0.821)					
PIER_01: The air quality is not good in the hotel.	2.41	1.60	0.680		
PIER_02: The working conditions are not good in the	2.50	1.59	0.787	0.8238	0.5396

hotel.					
PIER_03: There are many hidden risks in the hotel.	2.38	1.48	0.749		
PIER_04: The working atmosphere is very depressed in the hotel.	2.74	1.69	0.718		
PMR (Cronbach'α=0.859)					
PMR_01: The hotel does not attach importance to emergency drills.	1.79	1.28	0.694		
PMR_02: The hotel lacks practical contingency plans.	2.08	1.40	0.750		
PMR_03: The hotel rarely warns about job risks.	2.13	1.46	0.809	0.8549	0.5429
PMR_04: I am worried about the hotel's emergency response capabilities.	2.20	1.47	0.786		
PMR_05: I am worried about the hotel's ability to prevent work-related injuries.	2.55	1.65	0.631		

Table 5. Correlations and Squared Roots of AVE (Study 4)

Dimensions	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5
Factor 1: Perceived personnel risk	(0.723)				
Factor 2: Perceived equipment risk	0.676	(0.833)			
Factor 3: Perceived external environmental risk	0.279	0.331	(0.740)		
Factor 4: Perceived internal environmental risk	0.459	0.448	0.645	(0.735)	
Factor 5: Perceived management risk	0.356	0.339	0.594	0.655	(0.737)

Notes: 1. The diagonal element is the square root of the extracted mean variance. 2. The off-diagonal elements are the correlations between dimensions ($p < 0.05$).

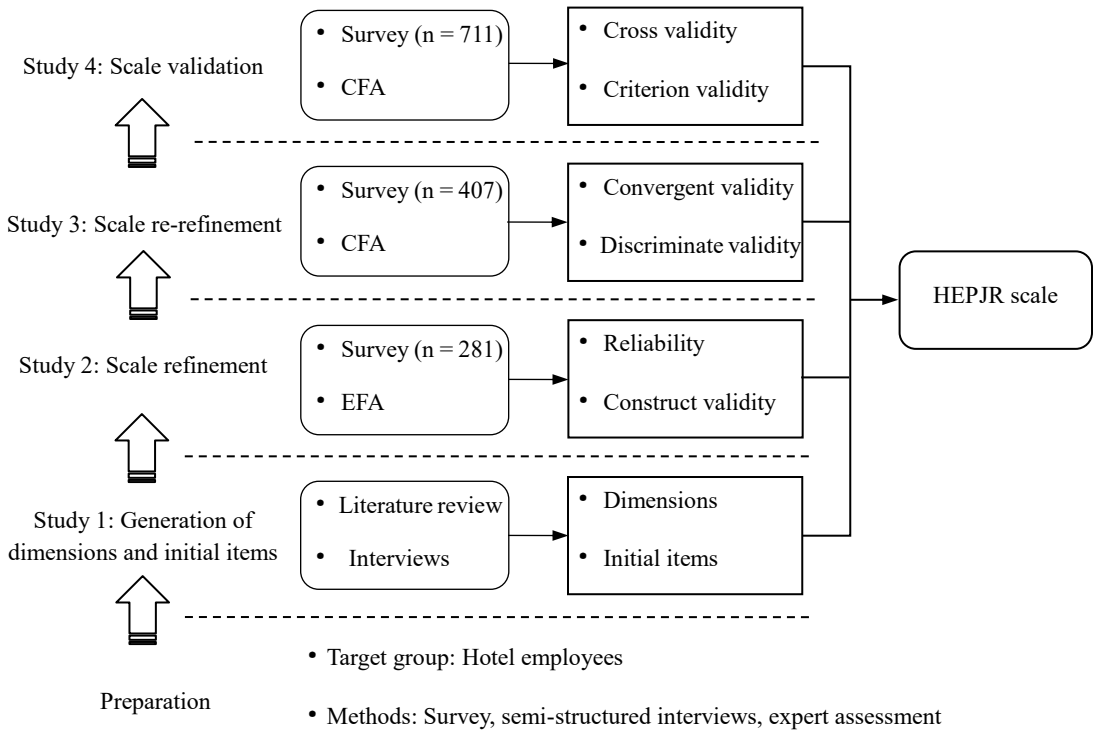

Figure 1. Methodological procedures of scale development.

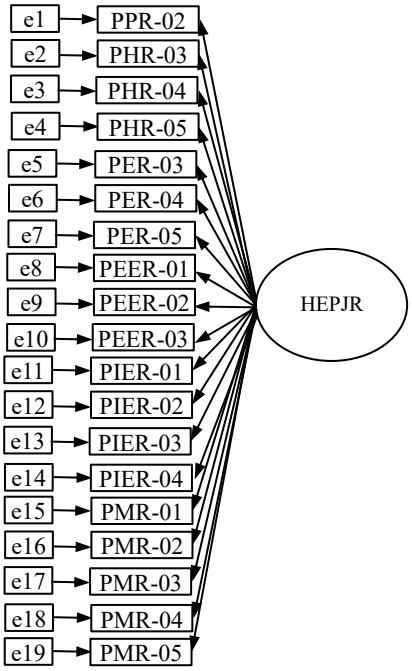

Figure 2-1

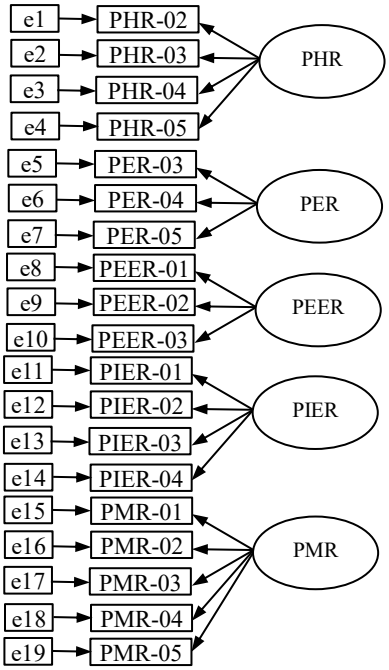

Figure 2-2

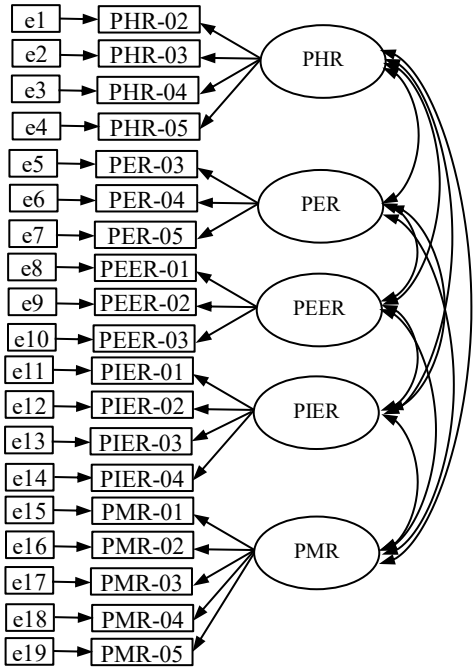

Figure 2-3

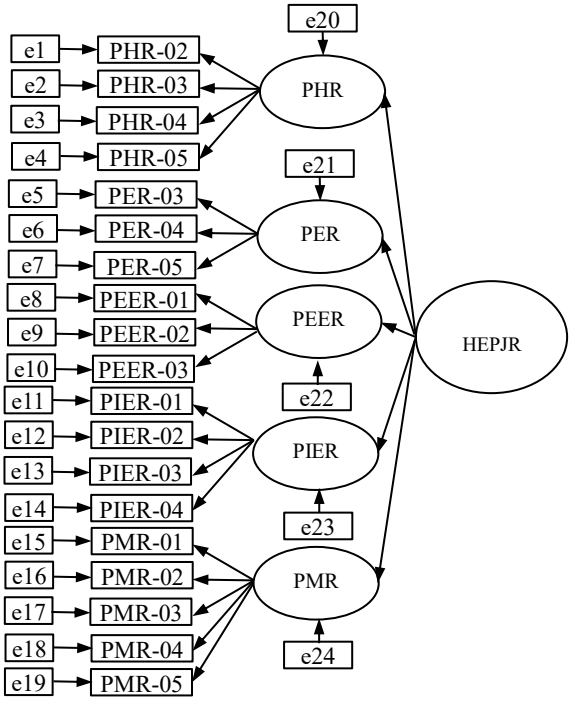

Figure 2-4

Figure 2. Comparison of HEPJR models